

## MEMORANDUM

To: Mr. A. M. Toye,  
Bridge Engineer,  
Bridge Division.

FROM: Foundation Section,  
Materials and Testing Div.,  
Room 107, Lab. Bldg.

Attention: Mr. S. McCombie

DATE: August 20, 1964

OUR FILE REF.

IN REPLY TO

SUBJECT:

## FOUNDATION INVESTIGATION REPORT

For

Proposed Retaining Wall #7, Adjacent  
to the Pine Point Arena, Hwy. 401,  
Twp. of Etobicoke, County of York,  
District No. 6, Toronto  
W.J. 64-F-76 -- W.P. 85-59-5

It is proposed to construct a retaining wall on the south side of the Pine Point Arena, which is located on the north-east corner of the intersection of Hwy. 401 and Islington Ave. At the request of Mr. J. B. Curtis, Regional Bridge Location Engineer, (memo dated July 22, 1964 and August 6, 1964), a foundation investigation was carried out in order to determine the subsoil conditions existing at the site of the proposed structure.

This report contains the results of the investigation, together with our recommendations pertaining to the design of the foundations.

The field investigation consisted of three sampled boreholes. The locations and estimated elevations of the boreholes are shown on the attached Dwg. #64-F-76A.

Subsoil conditions in the area are fairly uniform and favourable. It was found to consist of a deposit of glacial till consisting of clayey silt, sand and traces of gravel. The consistency of the material is in general, hard. The upper 15 ft.

cont'd. /2 ...

to 17 ft. of this deposit is oxidized and partially desiccated.

The proposed wall footings may be designed with an allowable bearing pressure of 3.0 tons per square foot. A minimum of 5 ft. of cover for frost protection is recommended for the footings.

Care should be taken to prevent softening of the foundation material by surface water during construction.

It was found that no stability problems are anticipated for the layout and construction of the proposed retaining wall. For calculating the resistance to sliding, a coefficient of friction of 0.5 may be assumed to apply between the subsoil and the footing bases.


No major dewatering problems are anticipated because of the impermeable nature of the subsoil.

The field work, performed during the period August 13 to August 14, 1964, was undertaken by Mr. T. Chan, Project Foundation Engineer, who also wrote this report. The investigation was carried out under the general supervision of Mr. M. Devata, Senior Foundation Engineer, who also reviewed this report.

We believe that you will find the factual data and recommendations contained therein, adequate for your design work. Should additional information be required, please do not hesitate to contact our Office.

TC/MdeF  
Attach.

cc: Messrs. A. M. Toye (2)  
H. A. Tregaskes  
H. D. McMillan  
G. K. Hunter (2)  
C. Fraser  
T. J. Kovich  
A. Watt  
Foundations Office  
Gen. Files

  
A. G. Stermac,  
PRINCIPAL FOUNDATION ENGINEER

APPENDIX I.

DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS & RESEARCH DIVISION

## RECORD OF BOREHOLE NO. 1

FOUNDATION SECTION

JOB 64-F-76 LOCATION Hwy. 401, Sta. 396+35, 200' Rt. ORIGINATED BY H.T.C.  
W.P. 85-59-5 BORING DATE August 13, 1964 COMPILED BY H.T.C.  
DATUM G.S.C. BOREHOLE TYPE Penn. Type Auger - 3 1/2" Ø CHECKED BY M.D.

SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— WL		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		BLOWS / FOOT	BLOWS / FOOT	PLASTIC LIMIT ——— WP	PLASTIC LIMIT ——— WP		
456.0	Ground Level							WATER CONTENT ——— W	WATER CONTENT ——— W		
0.0	Heterogeneous Mixture of Clayey Silt with Sand & Occasional Gravel (Glacial Till). Oxidized, brown, hard.		1	SS	54			WP ——— W ——— WL	WATER CONTENT %	X	
441.0			2	SS	50					PCF	
15.0	Changing to grey at elev. 441.0 approx.		3	SS	27						
			4	SS	29						
			5	SS	31						
			6	SS	62						
			7	SS	16						
416.5			8	SS	54						
39.5	End of Borehole										

W.L.  
426.5  
▽

DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS & RESEARCH DIVISION

## RECORD OF BOREHOLE NO. 2

FOUNDATION SECTION

JOB 64-F-76

LOCATION Hwy. 401, Sta. 395+00, 186' Rt.

ORIGINATED BY H.T.C.

W.P. 85-59-5

BORING DATE August 14, 1964

COMPILED BY H.T.C.

DATUM G.S.C.

BOREHOLE TYPE Penn. Type Auger - 3 1/2" Ø

CHECKED BY M.D.

SOIL PROFILE		SAMPLES			ELEV SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — WL		BULK DENSITY	REMARKS
ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT	SHEAR STRENGTH P S F.	PLASTIC LIMIT — WP	WATER CONTENT — W		
456.0	Ground Level										
0.0	Heterogeneous Mixture of Clayey Silt with Sand & Occasional Gravel. (Glacial Till)	1	SS	12	450						
	Oxidized, brown, stiff to hard.	2	SS	60							
441.0		3	SS	47	440						
15.0	Changing to grey at elev. 441.0, approx.	4	SS	34							
		5	SS	40	430						
		6	SS	76							
		7	SS	70	420						
416.5		8	SS	90/11"							
39.5	End of Borehole				410						

DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS & RESEARCH DIVISION

## RECORD OF BOREHOLE NO. 3

FOUNDATION SECTION

JOB 64-F-76

LOCATION

Hwy. 401, Sta. 393+98, 178' Rt.

ORIGINATED BY

H.T.C.W.P. 85-59-5

BORING DATE

August 14, 1964

COMPILED BY

H.T.C.DATUM G.S.C.

BOREHOLE TYPE

Penn. Type Auger - 3 1/2" Ø

CHECKED BY

M.D.

SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— W <sub>L</sub>		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT	SHEAR STRENGTH P.S.F.	PLASTIC LIMIT ——— W <sub>P</sub>	WATER CONTENT ——— W		
454.0								W <sub>P</sub> ——— W ——— W <sub>L</sub>	WATER CONTENT %		
0.0	Heterogeneous Mixture of Clayey Silt with Sand & Occasional Gravel, (Glacial Till). Oxidized, brown, Stiff to Hard.	1	SS	11	450						
		2	SS	52							
		3	SS	54	440						
437.5		4	SS	46							
16.5	Changing to grey at elev. 437.5, approx.	5	SS	35	430						
		6	SS	63							
		7	SS	92	420						
414.0											
412.5	Sand, very dense	8	SS	58							
41.5	End of Borehole				410						

## ABBREVIATIONS USED IN THIS REPORT

### PENETRATION RESISTANCE

STANDARD PENETRATION RESISTANCE 'N' - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A STANDARD SPLIT SPOON SAMPLER 12 INCHES INTO THE SUBSOIL, DRIVEN BY MEANS OF A 140 POUND HAMMER FALLING FREELY A DISTANCE OF 30 INCHES.

DYNAMIC PENETRATION RESISTANCE - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A 2 INCH, 60 DEGREE CONE, FITTED TO THE END OF DRILL RODS, 12 INCHES INTO THE SUBSOIL, THE DRIVING ENERGY BEING 350 FOOT POUNDS PER BLOW.

### DESCRIPTION OF SOIL

THE CONSISTENCY OF COHESIVE SOILS AND THE RELATIVE DENSITY OR DENSENESS OF COHESIONLESS SOILS ARE DESCRIBED IN THE FOLLOWING TERMS:-

<u>CONSISTENCY</u>	<u>'N' BLOWS / FT.</u>	<u>c LB. / SQ FT.</u>	<u>DENSENESS</u>	<u>'N' BLOWS / FT.</u>
VERY SOFT	0 - 2	0 - 250	VERY LOOSE	0 - 4
SOFT	2 - 4	250 - 500	LOOSE	4 - 10
FIRM	4 - 8	500 - 1000	COMPACT	10 - 30
STIFF	8 - 15	1000 - 2000	DENSE	30 - 50
VERY STIFF	15 - 30	2000 - 4000	VERY DENSE	> 50
HARD	> 30	> 4000		

### TYPE OF SAMPLE

S.S.	SPLIT SPOON	T.W.	THINWALL OPEN
W.S.	WASHED SAMPLE	T.P.	THINWALL PISTON
S.B.	SCRAPER BUCKET SAMPLE	O.S.	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S.	FOIL SAMPLE
C.S.	CHUNK SAMPLE	R.C.	ROCK CORE
S.T.	SLOTTED TUBE SAMPLE		
	P.H. SAMPLE ADVANCED HYDRAULICALLY		
	P.M. SAMPLE ADVANCED MANUALLY		

### SOIL TESTS

Qu	UNCONFINED COMPRESSION	L.V	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V	FIELD VANE
Qcu	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Qd	DRAINED TRIAXIAL	S	SENSITIVITY

# ABBREVIATIONS USED IN THIS REPORT

## SOIL PROPERTIES

$\gamma$	UNIT WEIGHT OF SOIL (BULK DENSITY)
$\gamma_s$	UNIT WEIGHT OF SOLID PARTICLES
$\gamma_w$	UNIT WEIGHT OF WATER
$\gamma_d$	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
$\gamma'$	UNIT WEIGHT OF SUBMERGED SOIL
G	SPECIFIC GRAVITY OF SOLID PARTICLES $G = \frac{\gamma_s}{\gamma_w}$
e	VOID RATIO
n	POROSITY
w	WATER CONTENT
$S_r$	DEGREE OF SATURATION
$w_L$	LIQUID LIMIT
$w_p$	PLASTIC LIMIT
$I_p$	PLASTICITY INDEX
s	SHRINKAGE LIMIT
$I_L$	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$
$I_C$	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$
$e_{max}$	VOID RATIO IN LOOSEST STATE
$e_{min}$	VOID RATIO IN DENSEST STATE
$I_D$	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
	RELATIVE DENSITY $D_r$ IS ALSO USED
h	HYDRAULIC HEAD OR POTENTIAL
q	RATE OF DISCHARGE
v	VELOCITY OF FLOW
i	HYDRAULIC GRADIENT
k	COEFFICIENT OF PERMEABILITY
j	SEEPAGE FORCE PER UNIT VOLUME
$m_v$	COEFFICIENT OF VOLUME CHANGE = $\frac{-\Delta e}{(1+e)\Delta\sigma}$
$C_v$	COEFFICIENT OF CONSOLIDATION
$C_c$	COMPRESSION INDEX = $\frac{\Delta e}{\Delta \log_{10} \sigma}$
$T_v$	TIME FACTOR = $\frac{C_v t}{d^2}$ (d, DRAINAGE PATH)
U	DEGREE OF CONSOLIDATION
$\tau_f$	SHEAR STRENGTH
$c'$	EFFECTIVE COHESION INTERCEPT
$\phi'$	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
$c_u$	APPARENT COHESION
$\phi_u$	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
$\mu$	COEFFICIENT OF FRICTION
$S_t$	SENSITIVITY

## GENERAL

$\pi$	= 3.1416
e	BASE OF NATURAL LOGARITHMS 2.7183
$\log_e a$ OR $\ln a$	NATURAL LOGARITHM OF a
$\log_{10} a$ OR $\log a$	LOGARITHM OF a TO BASE 10
t	TIME
g	ACCELERATION DUE TO GRAVITY
V	VOLUME
W	WEIGHT
M	MOMENT
F	FACTOR OF SAFETY

## STRESS AND STRAIN

u	PORE PRESSURE
$\sigma$	NORMAL STRESS
$\sigma'$	NORMAL EFFECTIVE STRESS ( $\bar{\sigma}$ IS ALSO USED)
$\tau$	SHEAR STRESS
$\epsilon$	LINEAR STRAIN
$\gamma$	SHEAR STRAIN
$\nu$	POISSON'S RATIO ( $\mu$ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
$\eta$	COEFFICIENT OF VISCOSITY

## EARTH PRESSURE

d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
$\delta$	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
$K_0$	COEFFICIENT OF EARTH PRESSURE AT REST

## FOUNDATIONS

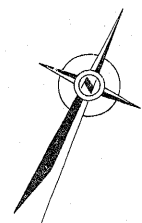
B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY, DEPTH AND COHESION ETC. IN THE FORMULA FOR BEARING CAPACITY
$k_s$	MODULUS OF SUBGRADE REACTION

## SLOPES

H	VERTICAL HEIGHT OF SLOPE
D	DEPTH BELOW TOE OF SLOPE TO HARD STRATUM
$\beta$	ANGLE OF SLOPE TO HORIZONTAL



# 64-F-76  
W.P. # 85-59-5  
Hwy. # 401  
PROP. RETAINING  
WALL # 7  
ADJACENT TO  
PINE POINT  
ARENA



BORE HOLE LOCATIONS & SOIL STRATA			
NAME T. C.	CHECKED	W.P. NO. 85-59-5	N.B. DRAWING NO.
NAME D. M.	CHECKED	JOB NO. 64-F-76	64-F-76 A
DATE 2 SEPT. 1964		SITE NO.	BRIDGE DRAWING NO.
APPROVED <i>[Signature]</i>		COUNT NO.	

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